

Speaking of the same subject, Prof. R. F. Stupart, Director of the Canadian Meteorological Service, says:

There is an undoubted tendency for the wind at Quebec to blow either up or down the river, e. g., when the barometric gradient would indicate an easterly wind, not uncommonly Quebec reports northeast, or when from the gradient northwest winds are indicated southwest winds are reported.

As regards the velocity, I question whether the highest winds occur near the city of Quebec. I am rather of the opinion that they occur farther down the river. Father Point wind velocities are usually higher than those registered at Quebec. Monsignor Laflamme's description of the geographical situation of Quebec is, I think, admirable. This situation is doubtless the cause of the greater preponderance of northeast and southwest winds than at other points in the river and gulf, but on the other hand I imagine that the various winds in the province generally are not by any means the outcome of mere local conditions in that province. The wind circulation there is connected directly with the general circulation over the continent.

With regard to the conditions which produce the wind circulation over the continent, the Weather Bureau and Canadian meteorological records show that the general track of storms in the colder months is either from the Great Lakes or Atlantic States to the Gulf of St. Lawrence and thence to the North Atlantic; this stream of low areas, with the high areas moving southeastward from the Northwest Territories to the Great Lakes or Middle States, produces the prevailing westerly winds in the Gulf of St. Lawrence.

As the spring advances the general tendency becomes more pronounced for the high areas to develop over the northeastern portion of the continent in the neighborhood of Hudson Bay and move southeastward, while the hovering low becomes more frequent near the Great Lakes and the northeast parts of the United States, and such conditions produce easterly gradients over the whole St. Lawrence Valley; there is not the same marked prevalence of northeast winds at stations on the Gulf of St. Lawrence as in Quebec. Later on again as the summer advances, the continental low spreads eastward across Canada toward Labrador, and southwesterly and westerly winds become prevalent in Quebec.

During the past three years observations have been taken at Cape Fullerton, the northwest point of Hudson Bay, and I find that, with Dawson, Fort Chippewyan, Norway House, York Factory, and Moose Factory, a very interesting weather chart of the northern part of the continent is obtained, and one which will be useful in the study of the cold waves.

A MISTAKE ABOUT ATMOSPHERIC DUST.

The importance of dust in the economy of the atmosphere is not to be underrated, but neither should it be overestimated.

We notice a paragraph going the rounds of the newspapers on the authority of the Sunday School Times, saying:

While the dust contains many of our mortal enemies, it is also one of our very best friends, and the finer it is the more we owe to it. If there were no dust, the sky would not be blue, there would be no raindrops, no snowflakes, no hailstones, no clouds, no gorgeous sunsets, no beautiful sunrises. The instant the sun passes out of sight we should be in darkness; the instant it rises it would be a sharp circle of light in a black sky. * * * Rays of sunlight go straight through all kinds of gases. * * * The light that we call daylight is the light of the sun's rays reflected from the particles of dust in the air about our earth.

These and similar expressions show that the author is not quite up to date in his study of physics. Rays of light do not go straight through the atmosphere, but are bent in curves by atmospheric refraction, and our long twilights are partly due to the curvature of these rays. If dust is present in the air, the light reflected therefrom has various tints of gray or red, depending on the size and nature of the particles of dust, but if no dust is present, light may be reflected from any minute particles of water or ice that happen to be present, and these are not generally called dust. Molecules of water or ice

sometimes form minute drops by gathering about particles of dust as nuclei, but they can also form such drops without dust as nuclei, and must frequently do so. However, if neither dust nor water were present in the atmosphere, we should still have our ordinary blue sky light, and some sunset sky colors. The deep blue of the sky is due almost entirely to the selective dispersion of the various waves or rays of light that come from the sun, by the action of the molecules of the constituent gases of the atmosphere. The ability of these molecules to absorb and reflect any given wave length depends upon the relative dimensions of the wave and the molecule. The exact relation has been carefully worked out by Lord Rayleigh, whose formulae explain not only the blue color of the sky, but also the polarized condition of that light. Dust particles and ordinary water or ice particles are relatively so large that they reflect all rays of light, with a slight possible predominance of the red rays or long waves; consequently the hazy whites and grays of foggy weather and the dirty reds of the Indian summer may be attributed to dust and vapor, which in fact obscure the deep blue sky light.

Aqueous vapor in its finest condition, when it begins to condense without the help of dust nuclei, has the power of selectively reflecting the longer or bright blue as distinguished from the shorter dark blue of the pure upper sky; the resulting bluish haze may often be seen under favorable atmospheric conditions when we look at a distant landscape, and especially in the pure air of oceanic islands. The blue haze off the west coast of Scotland is proverbial. This haze was first studied in the laboratory by Tyndall, when he produced it unexpectedly by allowing dustless moist air to expand inside a vacuum tube.

The beautiful colored sunsets observed in connection with the eruption of Krakatoa, and especially the brilliant colors brought out by Prof. Carl Barus, of Brown University, in his study of cloudy condensation, are not due to dust nor to the selective reflection by fine particles, but are examples of a very different process, i. e., the colors of thin plates, or what Newton called the colors of thin films. The central portion of each little sphere of water transmits a minute beam of sunlight which has been reflected to and fro within the sphere, and its waves have interfered with each other. Some have been reinforced and others have been annulled. The former give the beam that is seen by the observer, and its color depends on the diameter of the sphere or the thickness of the film of water.

In general, therefore, our beautiful atmospheric colors are not altogether due to dust.

ADDENDUM.

Hawaii.—A rather wet November, except in leeward Maui and leeward Oahu. Mean temperatures approximately normal, although night temperatures were low at intervals. Cold, wet weather during middle portion of month retarded cane growth and field operations, especially in windward plantations; condition of cane in Kau, Hawaii, materially improved, however, by showers. Young pineapple plants in good condition all month, and ripening of winter fruit quite general by close of month. Second crop rice damaged by high winds and heavy rain during middle of month in northern Kauai, windward Oahu, and portions of windward Maui. Coffee picking in progress all month; indications of rather light yield in windward Hawaii, but above average in Kona, Hawaii. Most leeward pastures in need of rain all month.—*Alex. McC. Ashley.*

THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and V.

The isobars of mean pressure for the month closely approach in contour those of the normal for the month of November,

with an area of high pressure over the northwestern and another over the southeastern portion of the country and the area of lowest pressure over the southern Plateau region.

The mean pressure for the month was somewhat above the normal in the central and northern portions of Washington, northeastern Idaho, western Montana, northwestern Wyo-

ming, and the eastern portion of the southern Plateau region; elsewhere the mean pressure was below the normal.

The greatest positive departure from the normal was +.06 inch and covered but a small area of northwestern Montana. The maximum negative departure was -.11 inch in extreme northeastern Maine, while departures ranging from -.05 to -.10 inch occurred over New England, New York, upper Michigan, Wisconsin, except the extreme southern part, northern Iowa, Minnesota, North Dakota, eastern South Dakota, western Arkansas, and the extreme northeastern portion of Texas.

The mean pressure for the month increased over that of October, 1905, in the southern portion of the South Atlantic States, Florida Peninsula, east Gulf States, southern and central portions of the west Gulf States, the southern slope, southern Plateau, south Pacific and middle Pacific regions, except the extreme northwestern portion of the last-named district; elsewhere the mean pressure diminished from that of the preceding month.

The greatest increases ranged from +.05 to +.09 inch and occurred over Florida, except the extreme northeastern portion, extreme southeastern Louisiana, upper Rio Grande Valley, central and western New Mexico, extreme southwestern Colorado, and eastern and southern Arizona. The decrease ranged from -.05 to -.10 inch in the Middle Atlantic States, upper Ohio Valley, Lake region, northern portion of the upper Mississippi Valley, upper Missouri Valley, North Dakota, and the greater portions of the middle and northern slope and north Pacific regions, and from -.10 to -.16 inch over New England, except western Connecticut.

TEMPERATURE OF THE AIR.

The mean temperature for the month was below the normal in Maine, New Hampshire, Vermont, western Massachusetts, in the islands off the southern New England coast, New York, and Pennsylvania, except the extreme southeastern portions, southeastern New Jersey, western Maryland, the Virginias, except the extreme southeastern portion of old Virginia, central North Carolina, eastern Kentucky, Ohio, southeastern lower Michigan, the extreme western portions of the Plateau regions, the Pacific coast districts, except the extreme southwestern portion, and the southwestern portion of the northern slope region; elsewhere the mean of the month was above the normal.

The minus departures, as a rule, were small, in but a few cases exceeding -2°, while the plus departures were generally quite marked, in most cases exceeding +2°, and over the greater portion of the region between the Mississippi River and the Rocky Mountains exceeding +4°, with the maximum departures ranging from +6° to +8° over northeastern Nebraska, eastern and northern South Dakota, northeastern Montana, North Dakota, and extreme western Minnesota.

By geographic districts the mean temperature for the month was below the normal in New England, the Middle Atlantic States, lower Lake region, and the Plateau and Pacific coast regions; elsewhere it was above the normal. In the districts where the mean was below the normal the departures were slight, while in those where they were above the normal they were marked, in North Dakota amounting to +8.3°.

Maximum temperatures of 90°, or higher, were reported from portions of southwestern Arizona and the extreme southern portion of the Florida Peninsula; and of 80° to 90° from extreme southeastern North Carolina, eastern South Carolina, eastern and southern Georgia, Florida, except the extreme western portion, southwestern Mississippi, extreme southern Arkansas, Louisiana, southwestern Indian Territory, the upper Rio Grande Valley, and Texas, except the extreme northwestern portion, extreme southeastern New Mexico, southwestern

Arizona, the southern third of California, and also in portions of the northern part of the Sacramento Valley. Maximum temperatures of 50° to 60° were reported from Maine, western Massachusetts, northern and western New York, northern lower Michigan, upper Michigan, northern Wisconsin, northeastern and northern Minnesota, in portions of the Rocky Mountain regions, and in eastern and south-central Washington. Over the remainder of the country the maximum temperatures ranged from 60° to 80°.

Freezing temperatures occurred as far south as southeastern South Carolina, central Georgia, southern Alabama, central Mississippi, northern Louisiana, central and southwestern Texas, and the southern border of New Mexico, in eastern and northern Arizona, and in interior California, except the extreme southern part.

Zero temperatures were reported from the northern portions of Maine, New Hampshire, and Vermont, portions of the mountain districts of New York, the extreme northern portion of lower Michigan, northern Wisconsin, Minnesota, northwestern Iowa, northern Nebraska, the Dakotas, Montana, Wyoming, western Colorado, northeastern Arizona, south-central Utah, central Nevada, east-central California, and southeastern Idaho.

Minimum temperatures from 20° to 30° below zero occurred over the greater portions of Minnesota, North Dakota, and the northern slope region.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	33.8	-0.7	-11.9	-1.1
Middle Atlantic	12	43.7	-0.3	-5.7	-0.5
South Atlantic	10	55.3	+1.2	-0.3	0.0
Florida Peninsula *	8	63.3	+1.7	+7.1	+0.6
East Gulf	9	59.1	+3.1	-2.4	-0.2
West Gulf	7	60.5	+4.1	-0.7	-0.1
Ohio Valley and Tennessee	11	45.3	+0.6	-6.8	-0.6
Lower Lake	8	38.0	-1.1	-9.7	-0.9
Upper Lake	10	34.8	+1.4	-2.0	-0.2
North Dakota *	8	31.6	+3.3	+9.6	+0.9
Upper Mississippi Valley	11	40.2	+3.4	-4.0	-0.4
Missouri Valley	11	42.4	+5.5	-0.7	-0.1
Northern Slope	7	35.6	+2.9	+0.8	+0.1
Middle Slope	6	46.0	+4.7	-2.7	-0.2
Southern Slope *	6	51.4	+1.9	-9.2	-0.8
Southern Plateau	13	46.8	-0.5	-5.4	-0.5
Middle Plateau *	8	37.3	-0.1	+1.8	+0.2
Northern Plateau	12	36.4	-0.2	+9.2	+0.8
North Pacific	7	44.6	-0.7	+7.7	+0.7
Middle Pacific	5	53.0	-0.5	+8.3	+0.3
South Pacific	4	56.7	-0.8	+5.1	+0.5

• Regular Weather Bureau and selected cooperative stations.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of the month differed widely from the average in Manitoba and the Northwest Provinces, the departure being as much as 12° in excess over the northern portions of Alberta and Saskatchewan and lessening to an excess of about 6° in the more southern districts. On the lower mainland of British Columbia and Vancouver Island the departure was in excess of the average by 1° or 2°. From the Great Lakes to the Maritime Provinces differences from average were nowhere pronounced, averaging about 1° below over most of Ontario and Quebec and from 1° to 2° above in the Maritime Provinces.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The precipitation was below the normal in the Atlantic and Gulf States, Ohio Valley and Tennessee, Lake region, North Dakota, and the northern Plateau and north and middle Pacific regions; elsewhere it was above normal.

Precipitation far in excess of the normal occurred over the

greater portion of the southern Rocky Mountain and southern Plateau regions.

It was especially heavy over the greater part of Arizona, where phenomenal amounts for the season were recorded. At Prescott the fall for the month was the greatest in a period of 35 years, and it is probable that in no previous November since records have been kept was the precipitation, both rain and snow, so generally heavy and well distributed over that section.

The total depth and the southern limit of snowfall are depicted on Chart X, and the depth of snow on ground at end of month on Chart XI.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
New England.....	8	2.65	69	-1.2	-6.2
Middle Atlantic.....	12	1.11	37	-1.9	-3.3
South Atlantic.....	10	0.87	30	-2.0	-9.3
Florida Peninsula *.....	8	0.91	41	-1.3	+1.8
East Gulf.....	9	2.45	64	-1.4	+1.3
West Gulf.....	7	3.85	97	-0.1	+2.0
Ohio Valley and Tennessee.....	11	2.28	62	-1.4	-2.2
Lower Lake.....	8	2.52	81	-0.6	-1.8
Upper Lake.....	10	2.16	84	-0.4	+0.4
North Dakota *.....	8	1.38	66	-0.7	+0.6
Upper Mississippi Valley.....	11	2.80	110	+0.2	+0.1
Missouri Valley.....	11	1.92	157	+0.7	+6.6
Northern Slope.....	7	0.72	138	+0.2	+3.0
Middle Slope.....	6	1.60	160	+0.6	+5.1
Southern Slope *.....	6	3.18	201	+1.6	+7.9
Southern Plateau *.....	13	3.06	546	+2.5	+8.0
Middle Plateau *.....	8	1.15	153	+0.4	+1.5
Northern Plateau *.....	12	1.12	62	-0.7	-2.1
North Pacific.....	7	3.23	47	-3.7	-9.9
Middle Pacific.....	5	1.99	59	-1.4	-5.8
South Pacific.....	4	2.32	176	+1.0	+3.5

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Professor Stupart says :

The precipitation in Vancouver Island and all the western portions of British Columbia was very light, being but a small fraction of the average. Farther east, however, at the higher levels it was average or a little in excess, and this was also the case in western Alberta. From eastern Alberta to western Manitoba, where it was mostly in the form of snow, there was a general deficiency, but to the eastward of this again as far as the neighborhood of Lake Huron there was an excess. * * * In the western portions of the Peninsula of Ontario, where it was part rain and part snow, it was nearly average, but in the more northern and eastern districts it was deficient, the largest departures occurring in the Ottawa Valley. In Quebec there was a very general small deficiency, while in the Maritime Provinces the precipitation, mostly in the form of rain, was very nearly average.

At the close of the month there was a light covering of snow over the more northern and eastern portions of the Northwest Provinces and also over most of northern Ontario, while in other parts of the Dominion the ground was either bare or nearly so.

CLEAR SKY AND CLOUDINESS.

Average cloudiness obtained in the Middle and South Atlantic States and middle slope and north Pacific districts; the cloudiness was below the normal in New England, Florida Peninsula, Ohio Valley and Tennessee, Lake region, upper Mississippi and Missouri valleys, and the northern Plateau region; elsewhere it was above the normal.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	5.2	-0.4	Missouri Valley.....	4.4	-0.5
Middle Atlantic.....	5.2	0.0	Northern Slope.....	5.0	+0.4
South Atlantic.....	4.5	0.0	Middle Slope.....	3.6	0.0
Florida Peninsula.....	3.9	-0.7	Southern Slope.....	5.1	+1.9
East Gulf.....	5.2	+0.7	Southern Plateau.....	4.4	+2.1
West Gulf.....	5.8	+1.2	Middle Plateau.....	4.2	+0.6
Ohio Valley and Tennessee.....	5.1	-0.6	Northern Plateau.....	5.1	-0.9
Lower Lake.....	6.7	-0.5	North Pacific.....	5.8	0.0
Upper Lake.....	6.8	-0.2	Middle Pacific.....	4.0	+0.2
North Dakota.....	5.3	+0.5	South Pacific.....	3.6	+0.7
Upper Mississippi Valley.....	4.8	-0.5			

HUMIDITY.

The average relative humidity was normal in the Florida Peninsula and the south Pacific region; above the normal in the Gulf States, upper Mississippi Valley, the slope and middle and southern Plateau and north Pacific regions; elsewhere it was below the normal.

The minus departures were quite marked in the Atlantic districts north of Florida, and the middle Pacific region, while the plus departures were very marked in the southern slope and southern Plateau regions.

The averages by districts appear in the following table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	70	-2	Missouri Valley.....	69	-2
Middle Atlantic.....	68	-7	Northern Slope.....	71	+4
South Atlantic.....	73	-5	Middle Slope.....	68	+4
Florida Peninsula.....	80	0	Southern Slope.....	74	+12
East Gulf.....	78	+2	Southern Plateau.....	71	+28
West Gulf.....	76	+2	Middle Plateau.....	64	+6
Ohio Valley and Tennessee.....	71	+2	Northern Plateau.....	69	+1
Lower Lake.....	75	+2	North Pacific.....	86	+2
Upper Lake.....	78	+2	Middle Pacific.....	68	-12
North Dakota.....	76	+2	South Pacific.....	67	0
Upper Mississippi Valley.....	76	+2			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex.....	23	50	sw.	Mount Tamalpais, Cal....	20	60	nw.
Block Island, R. I.....	29	60	sw.	Do.....	21	60	n.
Do.....	30	54	nw.	Do.....	26	57	nw.
Buffalo, N. Y.....	1	63	w.	Mount Weather, Va.....	6	60	w.
Do.....	6	62	sw.	Do.....	16	51	nw.
Do.....	24	55	sw.	Do.....	30	59	nw.
Do.....	25	58	sw.	Nantucket, Mass.....	29	52	sw.
Do.....	26	55	w.	North Head, Wash.....	18	72	se.
Cheyenne, Wyo.....	24	52	w.	Peoria, Ill.....	24	56	w.
Chicago, Ill.....	24	32	sw.	Port Huron, Mich.....	24	52	w.
Cleveland, Ohio.....	26	54	w.	Santa Fe, N. Mex.....	22	51	se.
Do.....	27	50	w.	Sioux City, Iowa.....	24	54	nw.
Devils Lake, N. Dak.....	27	50	ne.	Syracuse, N. Y.....	15	50	s.
Do.....	28	60	n.	Do.....	28	63	s.
Duluth, Minn.....	24	70	nw.	Tatoosh Island, Wash....	2	50	s.
Do.....	27	62	ne.	Do.....	17	52	e.
Do.....	28	68	ne.	Do.....	18	60	w.
Grand Rapids, Mich.....	24	60	sw.	Do.....	28	60	s.
Mount Tamalpais, Cal....	4	60	n.	Do.....	28	52	e.
Do.....	5	64	ne.	Do.....	29	53	e.

DESCRIPTION OF TABLES AND CHARTS.

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For description of tables and charts see page 20 of REVIEW for January, 1905.